Biogeosciences Discuss.,
doi:10.5194/bg-2016-265-RC1, 2016

Biogeosciences Discussions

Interactive comment on "Species-specific temporal variation in photosynthesis as a moderator of peatland carbon sequestration" *by* Aino Korrensalo et al.

Anonymous Referee #1

Received and published: 18 August 2016

Korrensalo et al. presents one season of field measurements (eddy covariance), controlled laboratory experiments and modeled results of net and gross photosynthesis rates and/or gross primary production from a boreal bog in southern Finland and emphasizes the species specific contributions and the integration of plot to ecosystem scales. In particular, Korrensalo et al. differentiate between the vascular and bryophyte (moss) contributions, where the latter is oftentimes given a shadow-role in the literature of carbon and energy fluxes. Here, mosses are emphasized to play an important role in the overall wetland ecosystem-level flux. The two approaches in reaching the total system fluxes (eddy covariance and species-specific laboratory experiments) arrive at similar total seasonal fluxes. However, the figures suggest rather large seasonal dif-

ferences (if I interpret them correctly). I would therefore appreciate increased attention to why that is. In fact, I think this difference is an interesting story (the story?) that emerged. Below are some thoughts that came to me as I reviewed.

Please define gross primary production (GPP), net (PN) and gross (PG) photosynthesis so reader who are not regularly working with these terms can follow your manuscript.

All figures: The graphs are presented with units, but there are no labels on the y-axises. Please include labels.

Figure 1a: Why the discrepancy between the "total" and "eddy covariance" in Figure 1? It is unclear from the figure caption, but I think the two curves represent the laboratory derived estimate (total) and the eddy covariance estimate (eddy covariance) of the same variable? So why is the Total > EC in early season and EC > Total in later season?

Figure 1d: What does "daily lawn surface water table" represent? I am confused by the word "lawn" (makes me think of a golf course). I suggest removing the smoothing curve and not include any line between dots unless the dots represents continuous daily measurements of water levels (there seems to be a larger data gap around Julian day 210).

Figure 1b: I suggest plotting mean daily air temperature and then present the min and max daily air temperature as a shaded fill behind the mean daily air temperature line.

Figure 1 (figure caption): Why keeping the laboratory temperature at 20°C during the entire growing season if the mean daily air temperature only reached 20°C during a few days? What is the implication of this approach on the analyses? Can this partly explain the offsets in Fig 1a? We see a large drop in water tables in the field site following Julian day 120. The laboratory measurements tried to keep the temperature and moisture contents constant throughout the season, while the field measurements of air

temperature and water table (ie moisture) present rather large variations. How does the limited moisture variability of the laboratory approach affect the overall conclusions stated by the authors? I am worried the authors may have over-stated their findings due to the complex relationships between water, air temperature and photosynthesis found in the field setting, especially considering the deviations in Figure 1a. In combination with Figure 2 (which I assume is based upon laboratory analyses, please clarify in figure text), it looks to me like the vascular plants may have been water-limited (too much water) in their photosynthesis in early season in the field (??)

Figure 3b. Why the decreasing response of the Sphagnum species throughout the study period? The total seasonal gross photosynthesis is similar between the two methods, but the distribution of those fluxes over the season is rather different between the two methods (laboratory versus eddy covariance). This observation is currently not discussed in the manuscript and I think this is the most interesting piece of the results.

I would like to see the text in the results section to address the seasonal variability that we see in the figures. The results section is currently focusing on the total seasonal values, while the figures show some rather interesting seasonal variations (in time and between methods).

Please refer to specific figures in the discussion.

Page 7, Line 33: The sentence is odd. Remove “when” perhaps?

The discussion refers to time by naming the month. I suggest all graphs use months instead of Julian day.

The discussion or literature does not address the impact on hydrology to the photosynthesis, which, especially for mosses, can have a major impact.

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-265, 2016.